الجمهورية الجزائرية الديمقراطية الشعبية
People's Democratic and Republic of Algeria

Ministry of Higher Education and Scientific Research
National School of Cyber Security

وزارة التعليم العالي والبحث العلمي
المدرسة الوطنية العليا في الأمن السيبراني

ALGORITHMS AND STATIC DATA STRUCTURES

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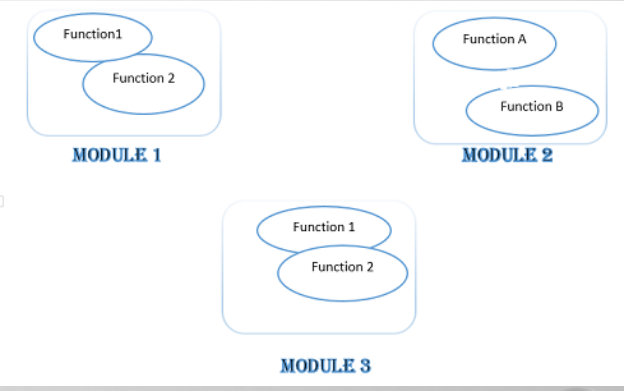
Objectives

- To acquire a methodological approach focused on modularity, allowing to design and develop a small software application using elementary objects and statically structured data (1D and 2D arrays, strings, sets, records).
- To be able, starting from a problem statement, to:
  - Break it down into modules.
  - Analyze and separately construct the different modules (main and secondary).
  - Validate each module.
  - Separately program the various algorithms corresponding to modules (main and secondary).
  - Create a technical programming report.



Hourly volume

Semester 1: Algorithms and static data structures				
Hourly volumes				
Course	**TD/TP**	**TP**	**Other (specify)**	**Total**
30 hours	60 hours		-	90 hours

Content (1)

Chapter 1: Basic elements (03-04 hours)

- Algorithm, processor, action
- Programs and programming languages
- From problem to result
- Analysis of a problem

Content (2)

Chapter 2: Presentation of the Algorithmic Formalism (07-08 hours)

- Need for an algorithmic formalism
- Presentation of the adopted algorithmic formalism
  - Structure of an algorithm
  - Environment: Elementary objects
    - Objects in an environment
    - Statements
    - Declaration of constants
    - Declaration of simple types
    - Variable declarations
  - Algorithm body
    - Control structures
    - Other basic actions (arithmetic, logical, mixed expressions, read, Write)

Content (3)

Chapter 3: Basic elements of the Pascal/other programming language

The programming language will not be taught at the course level but through a documentation. The implementation will be done at TD/TP.

- Structure of a program
- Body of the program
  - Assignment, Expressions, Block
  - IF statement, CASE OF statement
  - FOR statement, WHILE statement, REPEAT statement
  - Entry procedures: READ and READLN
  - Exit procedures: WRITE and WRITELN
  - Program documentation
- Program environment
  - Definition of an identifier
  - Declaration of constants, types, variables
- List of reserved words
- Example of a program in Pascal

Content (4)

Chapter 4: Modularity (15-16 hours)

- Fundamental concepts and benefits of modularity
- Types of modules
  - Examples
  - Communication mechanism
  - Passing parameters
- Functions
  - User functions (Structure, Calling, Declaration)
  - Standard functions
  - Functions in Pascal language
- Procedures
  - User procedures (Structure, Calling)
  - Standard procedures
  - Procedures in the Pascal language
- Internal and external modules
- Local objects and global objects

Content (5)

Chapter 5: Static data structures (05-06 hours)

- One-dimensional tables
- Sorting (selection, transposition, bubbles, by count, Shell)
- Two-dimensional tables
- Strings of characters
- Sets
- Recordings

Personal work

- Three (03) practical works (TP) must be carried out
  - Two (02) TP must be on modularity.
- TP involve implementing the studied approaches and producing TP reports including:
  - Problem statement
  - Potential modular division
  - Analysis
  - Algorithms of the different modules
  - Test cases
  - Program listings
  - Results

Knowledge assessment method

- 02 intermediate tests: CI
- 03 practical assignment tests: TP
- 01 quick test grade: TR
- 01 participation bonus

$$Final\ score = \frac{CI * 5 + TP * 3 + TR * 2 + Bonus}{10}$$

Coefficient : 05

Number of credits : 06

Bibliography

- Wirth, N. “Systematic Programming: An Introduction”. *Prentice Hall* (1973)
- Knebl, H. "Algorithms and data structures." *Cham: Springer Nature Switzerland AG* (2020).
- Meyer, B., and Baudouin, C. "Programming methods“. *Two parts: Part* 2 (1982).
- Goldschlager, L. and Lister, A. "Computer science: A modern introduction". *Prentice Hall International* (1982).

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